a) delaying said talent signal by an varying delay amount responsive to said relative delay which may vary;

b) adjusting the level of said talent signal in delayed or undelayed form in a variable gain circuit and providing a cancellation signal in response to the delayed version thereof;

c) wherein in step a) said varying delay amount and in step b) said level are automatically responsive to at least one of said mix minus signal and said feedback signal and;

d) providing said mix minus signal in response to said feedback signal and said cancellation signal;

wherein said varying delay amount of step a) is automatically adjusted in response to comparison of said feedback signal and said talent signal in undelayed form, and said level of step b) is automatically adjusted in response to said mix minus signal and said talent signal in delayed form.

REMARKS

Claims which are not amended are reproduced for convenience.

New drawings are enclosed herewith.

Numbered paragraphs below correspond to the same numbered sections of the March 16, 2000 office action.

2. Claims 8-17 and 28, 32-36 and 39 were rejected under 35 U.S.C. 112 first paragraph in respect to "Correlation circuit" used in those claims "do not read on figure 2". Applicant respectfully requests reconsideration of this rejection. At page 15, top paragraph, it is explained that the adjustment circuit 16 (of figure 2) "allowing adjustment of the delay 12 and/or gain 14 automatically in response to the signals(s). The inventive concepts of performing automatic adjustment will be described in more detail with respect to the preferred embodiment of Figure 3". In Figure

3 a Correlate and Adjust element 15a is shown and described in detail. It is also noted that the phrase "correlation circuit" is well known to one of ordinary skill in the art, and in fact integrated circuits which perform correlation may be purchased. In that the teachings of the instant specification clearly demonstrate the preferred embodiment connection between Figure 2 and the correlation circuit of the above claims, withdrawal of this rejection is respectfully requested.

It is noted that claim 39 does not contain a correlation limitation, and as Kirby makes no suggestion of the pitch correction element of claim 39 this claim is believed allowable. Reconsideration is respectfully requested.

3, 4. Claims 1-4, 6, 19, 20-22, 23, 25, 27, 30, 31 and 37 were rejected under 35 U.S.C. 102(b) as being anticipated by Kirby. It is believed that claim 19 was intended to be 18 since 19 was objected to in section 5 and claim 18 is listed as rejected on the cover sheet. Please advise if this belief is incorrect. The examiner pointed to Kirby providing: a mix minus signal (output of 34) from a feedback signal (14) having a variable amount of delay (10, 21 and 22). Applicant notes however that the cancellation circuit 30 operates on a further delayed version of the feedback signal 14.

Claims 1-3 have been amended to specify that the combining circuit is responsive to the feedback signal without further substantial variable delay. It is noted that as a practical matter, all practical signal processing circuitry provide some variable delay to the signals which they are operating on (especially with temperature variation), and the delay may be variable, consequently the word substantially is intended to distinguish over an intentional variable delay like Kirby's 21.

It is believed that claims 20-22 as presently amended distinguish over Kirby.

While Kirby does recognize that the relative delay of the mixed and unwanted signals may be varying (page 2, ¶4) there is no mention or suggestion that the delay measurement system 10 operates continuously or repeatedly, or that the delays 21 and 22 be adjusted continuously or

repeatedly in response to changing delay.

Starting at page 4, line 11 Kirby states that the delays 21 and 22 are adjusted to co-time the unwanted and mixed signals. Kirby states at lines 11-16 "The measurement of delay is then used to control two audio delaying devices ·in order to co-time approximately the two signals" (emphasis added). "After being co-timed ·[the signals] are applied to an adaptive cancellation circuit 30". This description of the step by step operation; first measure delay, then adjust delay, then apply signals to adaptive cancellation, teaches away from a continuous delay measure and adjust which is taught in applicant's invention, for example with respect to the description of Figure 3 on page 15. Further, Kirby does not suggest that delay 21 is ever unnecessary for this operation.

At line 18 Kirby states that circuit 30 automatically corrects for any remaining small delays between the signals. It is apparent from the subsequent description by Kirby that the resolution and control of Kirby's delays 21 and 22 is insufficient to place and keep the two signals in close enough timing for his circuit 30 to perform the cancellation without the additional delay capability which "corrects for any remaining small delays between the signals". The need for the adaptive cancellation circuit 30 to compensate for such additional delays is especially critical when the relative delay between 14 and 12 is changing.

Kirby further teaches, starting at page 6 line 11,

> Small variations in this delay [of the mixed and unwanted signals] are of no concern as these are eliminated by the adaptive canceler. However as the relative delay increases further, the adaptive canceler 30 will move towards one end of its range as imposed by the hardware implementation, i.e. the adaption will "move" the centre of the filter along the filter hardware, reducing its effectiveness as it nears one end. For extreme variations in relative delay the adaption

will attempt to move the filter beyond the end of its range and the required cancellation will not occur.

This problem is overcome by using the delay measuring system 10 to vary the compensating audio delays 21, 22 as changes in the relative delay of the incoming signals are detected. When small changes in delay are detected the system makes no compensation adjustment until the aggregate of these changes may affect the effectiveness of the adaptive cancellor 30. At this point the compensating audio delay could be changed inaudibly to match the new delay value and centre the adaptive canceller at the mid-point of its range (emphasis added).

Kirby states "the compensating audio delay could be changed inaudibly to match the new delay value and centre the adaptive canceller at the mid-point of its range". He does not actually state that this level of performance has been achieved, or will even work with the embodiments of the invention he teaches.

While Kirby does recognize that it is important that "adaption operation is rapid and responsive to changes in the signals" he does not recognize or solve the delay change problem without interruption, nor does he describe how to overcome the problem of 30 needing to be recentered. Presumably either a delay change or a need to recenter 30 would require restarting Kirby's procedure, i.e. measuring the new delay, adjusting the delays 21 and 22 to a new value, and readapting 30. In such an event, the delay times involved in at least the new adaptation of 30 would cause significant disruption of the performance, with highly undesirable consequences if such event occurred while the system was in use by some performer.

Claim 20 is believed to distinguish over Kirby by reciting in step a) delaying said talent signal by a varying delay amount in continuing response to said variable amount of delay.

Claim 21 calls for varying delay amount in continuing response to said varying relative timing and Claim 23 calls for varying delay amount continually responsive to said relative delay. In Kirby when small changes in delay are detected the system makes no compensation adjustment until the aggregate of these changes may affect the effectiveness of the adaptive cancellor 30.

The dependent claims 4, 18, 23, 25, 27, 30, 31 and 37 are believed to further distinguish over Kirby as well.

In claim 4, 23, 25, 30 and 37 the amount of delay is responsive to the feedback signal. In Kirby changes in delay do not result in a change of the variable delay 21 or 22 until the adaptive filter 32 nears the end of its range, thus the delays amounts are not responsive. If Kirby is interpreted to operate in response to changes in delay as a result of the adaptive filter nearing the end of its range, then the amount of delay is responsive to the centering of the adaptive filter when the filter approaches the end of its range.

In claim 18 the delay is automatically adjustable in response to changed in relative delay whereas in Kirby the delay is not automatically adjustable since delay changes are compensated by the adaptive filter 32.

In claim 25 the level step is responsive to the feedback signal. In Kirby the examiner points to level changes as being performed by gain circuit 32 which is responsive to the mix minus signal from 34 via delay 36.

In claim 27 at least one of the varying delay amount and level is responsive to the talent signal in delayed form. In Kirby the varying delay is responsive to the talent signal in undelayed form and the gain is responsive to the mix minus signal.

In claim 31 at least one of the varying delay amount and level of the talent signal to provide the cancellation signal is responsive to the mix minus signal and the talent signal which has been gain adjusted. In Kirby the variable delay is not responsive to the mix minus signal.

The gain section 32 adjusts the talent signal and the control of the gain comes from the mix minus signal.

5. Claims 5/1, 7/1, 24/20, 26/20, 29/20 and 38/20 which were objected to as being dependent upon rejected base claim have been rewritten in independent form. Claims 5/1, 5/2, 7/1, 7/2, 24/20, 24/21, 26/20, 26/21, 29/20, 29/21, 38/20 and 38/21 which were objected to as being dependent upon rejected base claim have been rewritten in independent form as new claims 40-53. It is believed that these claims as presently presented are allowable.

6. Applicant has reviewed the Umemoto reference and notes that it is far less pertinent than the Kirby reference of record. Applicant also respectfully disagrees with the examiner's characterization of Umemoto as providing a mix minus signal as that term is used in the instant specification.

Respectfully submitted,

J. Carl Cooper
Reg. #34,56

CERTIFICATE UNDER 37 CFR 1.8(a)

I hereby certify that this correspondence is being deposited this day with the United States Postal Service postage prepaid as First Class Mail, in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.

Date 3/21 2000

J. Carl Cooper, Reg. #34,568
